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Jeffrey C. Hood
MEYERTONS, HOOD, KIVLIN, KOWERT & GOETZEL
P.O. Box 398
Austin, TX 78767

EXAMINER
WOODS, ERIC V

ART UNIT	PAPER NUMBER
2672	

DATE MAILED: 12/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/090,489	OBEROI ET AL.
	Examiner	Art Unit	
	Eric Woods	2672	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 November 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *7-10,17-22,24-33* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7-10,17-22,24-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 7-11, 16-22, and 24-33 have been considered but are moot in view of the new ground(s) of rejection.

The finality of the previous Office Action is being withdrawn.

This new final Office Action is being sent *sua sponte* without respect to the arguments put forward in the last response. As such, there are no grounds for petition under 37 CFR 1.181, as applicant's after-final amendment did not change the claims; the claims were previously amended before the last final. As such, the previous final was proper, and the same circumstances apply herein (Petitions: please note last Office Action). This new action resets the response period.

Applicant's arguments that there is no motivation to combine Morein with Haeberli are simply demonstrably incorrect. The system of Morein clearly teaches an accumulation buffer but does not provide certain details on its depth or operation. The system of Haeberli is an academic research paper directed specifically to the concept of the accumulation buffer and its optimization. Very clearly, the techniques of Haeberli could be used to modify Morein to have certain optimal characteristics whilst it is in the process of performing accumulation buffering.

Claim Objections

Applicant is advised that should claim 28 be found allowable, claim 29 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof.

When two claims in an application are duplicates or else are so close in content

that they both cover the same thing, despite a slight difference in wording, it is

proper after allowing one claim to object to the other as being a substantial

duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Cancellations

Claims 1-6, 11-16, and 23-24 are cancelled by applicant, with claims 25-

33 having been added by the amendment of 25 May 2005.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for

all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1,

148 USPQ 459 (1966), that are applied for establishing a background for

determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Morein in view of Haeberli and MacInnis et al (US 6,570,579 B1).

In regards to claim 7, Morein and Haeberli in combination clearly teach a

method comprising: **(a) reading a first stream of image pixels corresponding**

to an image X_K from an image memory; (b) reading a second stream of

pixels corresponding to an image A_K from an accumulation buffer; (c)

blending each image pixel of the image X_K with the corresponding pixel of

the image A_K based on an alpha value provided with the image pixel, and

thus, generating a third stream of output pixels defining an image A_{K+1}; and

(d) transferring the third stream of output pixels to the accumulation buffer;

(e) performing (a), (b), (c), and (d) for each image after the first image of a

sequence of N images X_K for K=0, 1, 2, ... N-1.

- Morein teaches a method and apparatus for supporting

  accumulation buffering in a video graphics system (Col. 2, lines 3-

  36), which explicitly is accumulating each image in a sequence of

  images X_K, K=0, 1, 2, ... N-1. All video comprises a sequence of

  images.

- Morein teaches blending together pixel data from the drawing

  buffer (140) and the first (170) or second accumulation buffer (180)

  using the controller (160), which specifically is reading a first stream

  of image pixels and second stream of image pixels as recited in the

  instant claim (Col. 5, line 10 - Col. 6, line 12 and FIG. 1). Thus, said

  drawing buffer specifically is an image buffer. The controller reads

  the pixel data from the drawing buffer and adds said pixel data to

  the corresponding pixel data in the accumulation buffer based on

  the information found in the mask buffer (150). Said mask buffer

  allows the accumulation process to be performed efficiently by

indicating only the relevant pixel data. In addition, Morein teaches that once a predetermined number of accumulation operations have occurred for a predetermined number of images, said first accumulation buffer acts as the output buffer (Co1. 6, lines 13-25). Thus, said blended pixel data is transferred back and stored in the first accumulation buffer. Then the second accumulation buffer takes over the next predetermined set of accumulation processes. In other words, the first and second accumulation buffer takes turn accumulating pixel data for each sequence of image.

- Although Morein does not explicitly teach blending images based on alpha values, it is well known and standard in the art that blending images using accumulation buffer requires alpha blending. Blending a plurality of layers specifically must be performed using not only the color values but also the alpha values. Said alpha values determine the weight given to each image in the set of images being blended together.

- A buffer is clearly a type of memory by definition. While the terms are not absolutely interchangeable, a buffer is a type of memory. The word buffer in this context can be replaced by the word memory, and such substitution **is a broadening amendment**, thus warranting the final status of this Office Action. Clearly, the buffers of Morein are memories and thus teach this limitation.

- Obviously, when the system is initialized, the contents of all buffers and memories (at least image buffers and memories) will be set to null. The first image or stream would be stored in one buffer, but it would make no sense whatsoever to combine or blend it with a null or nonexistent image. Therefore, it would be obvious that only after the second image or stream had arrived that each image should be combined as set forth in the instant claim.

- MacInnis clearly provides a system that performs alpha blending 1:55-2:15, where such alpha blending can be done on a per-pixel basis, as noted above (15:47-16:5).

It is well known in the art that frame buffers typically store data in an RGBA (red, green, blue, alpha format). An analogous art, Haeberli et al. teaches that the accumulation buffer provides 16 bits to store each red, green, blue, and alpha color components (Pages 31 1, Section 3.2). Thus, by definition, blending the alpha color components of all images being blended specifically is blending based on the alpha value provided with each pixel. Haeberli is **ONLY** utilized to show that the accumulation buffer has RGB and alpha (A) channels. Note the discussion concerning the limitations of Haeberli in the Response to Arguments section in the previous Office Action, which is incorporated by reference. Further, Haeberli specifically sets forth on pages 311-313 the benefits of using accumulation buffering to eliminate anti-aliasing and how the implementation used by the authors (e.g. Haeberli) has certain advantages, which further provides motivation.

Alpha blending is obvious and well known in the art, as stated in the last

Office Action. MacInnis is added as proof of this statement.

It would have been obvious to one of ordinary skill in the art at the time of

the invention to take the teachings of Morein and to modify it by adding the

method of blending each image pixel based on the alpha value of each image

pixel in order to implement standard blending using the accumulation buffer. The

alpha values dictate the opacity of each image pixel, which influence the weighed

average of the color values for each pixel, and thus blending by alpha value is a

necessary standard technique well known in the art as shown in MacInnis, since

this modification would allow the creation of multiple region graphics and provide

many other useful capabilities to the system of Morein, which has accumulation

buffers that prima facie possess alpha values on a per-pixel basis as specified in

Haeberli (and accumulation buffers have been known to have alpha values on a

per-pixel basis since Haeberli, well over twelve years before the filing of the

instant application, and a decade before the filing of the Morein and MacInnis

application), since this allows the specification of quadruplet RGBA values for

writing to the accumulation buffer, which is known to be more efficient, and for

the reasons specified in the previous Office Action.

It is also respectfully noted that Morein in 2:1-45 clearly states that

multiple images of a plurality or set of images can be composited together as

recited by applicant in step (e), so that argument is also inapposite. Further,

Morein and MacInnis both process video data, where clearly a set of images is

processed as required in step (e), so under either interpretation the references of record still teach those limitations.

Specifically, the system of Morein performs blending which is known to be alpha blending (2:1-47) with respect to color, depth, transparency, and the like. Morein does not expressly teach blending on a per-pixel basis. Such a limitation is at least fairly suggested by Haeberli as above. However, since applicant insists on such being made explicit, examiner will make the MacInnis reference of record as proof that blending on a per-pixel basis is well known and obvious. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Morein in light of Haeberli and MacInnis to utilize per-pixel alpha blending since MacInnis teaches that (6:30-45, 6:59-7:15, 9:15-25, 13:25-50) such techniques produce better anti-aliasing, provide more efficient execution, use less memory, and otherwise reduce memory bandwidth, which agrees with Haeberli, which also teaches a per-pixel weight factor (even though applicant continues to refuse to acknowledge this point).

In reference to claim 9, Morein, Haeberli, and MacInnis teach the method of claim 7 as described above. In addition, Morein and Haeberli et al. teach in combination said blending comprises blending red, green and blue components of each output pixel in parallel.

As applied to claim 7 above, all color values are blended together for each pixel (Col. 5, line 26 - Col. 6, line 25). Since Haeberli et al. teaches that accumulation buffers provides storage for RGB and alpha color values, blending color values together as taught by Morein specifically is blending RGB and alpha

values together. And since all color values for each pixels are blended together,

said blending of RGB and alpha values must be performed in parallel.

In reference to claim 10, Morein, Haeberli, and MacInnis teach the method

of claim 7, but do not explicitly teach wherein (a), (b), (c), (d) and (e) are

performed by a graphics hardware accelerator chip in response to software

functions executed on a host processor. Although Morein and Haeberli et al. do

not explicitly name a hardware accelerator, the prior art discloses the overall

architecture of one embodiment where the system is implemented on a

processor, a state machine, or other circuitry (Col. 5, lines 26-30 and Col. 7, lines

6-16). Said graphics system comprising an integrated circuit specifically is a

hardware accelerator chip performing in response some sort of software

commands to perform (a), (b), (c), (d), and (e). Also, the instruction is given via

software since that is the conventional method of communication between the

processor and the rest of the graphics hardware. Thus, it would have been

obvious to implement the graphics system of Morein and Haeberli et al. using a

hardware accelerator chip. Further, take note of MacInnis, which clearly shows a

hardware accelerator chip as part of the set-top box as noted above, see Figures

1-5 as an illustration of this.

In regards to claim 17, the same basis and rationale for claim rejection as

applied to claim 7 above. The limitations of claim 17 are identical to the

limitations of claim 7, except for one added limitation directed to the mixing unit.

Morein explicitly teaches a mixing unit (Col. 5, line 26 - Col. 6, line 25). Said

controller (160) specifically is a mixing unit. MacInnis also teaches a mixing unit,

otherwise known as the blending unit, see for example (note Fig. 28, specifically

Figure 3, the video compositor unit 60 contains the blending unit).

Claims 8, 18-19, and 22 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Morein in view of Haeberli and MacInnis, and further in view of

McReynolds.

In reference to claims 8 and 18, Morein, Haeberli, and MacInnis teach the

method of claim 7, but does not explicitly teach the color precision of the

accumulation buffer is greater than the color precision of the image buffer. It is

well known and obvious, however, to implement a more precise output data

calculation in order to avoid losing original data precision and minimize aliasing.

An analogous art, McReynolds et al., teaches said limitations.

- McReynolds et al. teaches that 'in order to maintain accuracy over
  many blending operations, the accumulation buffer has a higher
  number of bits per color components than a typical color buffer
  (section 6.4, lines 3-4). Higher number of bits per color
  components will result in greater color precision for the
  accumulation buffer.

It would have been obvious to someone of ordinary skill in the art to take

the teachings of Morein, Haeberli, and MacInnis and to add from McReynolds,

the method of providing higher color precision of the accumulation buffer than the

color precision of the image buffer in order to maintain color precision accuracy

over many blending operations. This prevents loss of data and alleviates aliasing

problems. It is always important to maintain precise accuracy of data after any data processing.

In reference to claim 19, Morein, Haeberli, and MacInnis teach the method and system of claim claims 7 and 17 above and Morein, Haeberli, and MacInnis and McReynolds teach the system of claims 8, 18, and 22 above. In addition, remember that Morein teaches a first and a second accumulator in order to minimize the delay between accumulation and rendering. Since each pixel provides a RGB color component and an alpha value, each of the plurality of accumulators is capable of mixing a corresponding color component. Morein also explicitly teaches that if the color data includes multiple color portions, such as red, green, and blue portions, each of these portions will be treated individually by the output block (Col. 6, lines 37-42), and thus it would have been obvious to one of ordinary skill in the art at the time of the invention to take the teachings of Morein and Haeberli and to implement a plurality of mixing units to accumulate individual color components. Since parallel processing is well known and obvious in the ad, it would have been obvious to use a plurality of mixing units to comprise the controller (160) of Morein. Haeberli et al further suggests this, since an accumulator buffer comprises 16 bit to store each red, green, blue, and alpha components, it would be wise to apply a different mixer for each component in order to perform parallel processing and speed up the overall image processing.

In reference to claim 22, Morein, Haeberli, and MacInnis teach the system of claim 17, and Morein, Haeberli, MacInnis, and McReynolds teach the system of claim 18 above. While Morein, Haeberli, and MacInnis do not explicitly teach

the color precision of the accumulation buffer is at least ΔN larger than the color precision of the image buffer, wherein ΔN is the base two logarithm of the maximum number of images to be blended into the accumulation buffer, McReynolds et al. teaches said limitation in the following in similar fashion as applied to claims 8 and 18 above.

As applied to claims 8 and 18 above, McReynolds et al. teaches that in order to maintain accuracy over many blending operations, the accumulation buffer has a higher number of bits per color components than a typical color buffer (section 6.4, lines 3-4). Higher number of bits per color components than a typical color buffer is interpreting broadly as to include the bit range ΔN larger than the color precision of the image buffer. The definition of ΔN, base two log of maximum number of images to be blended into the accumulation buffer, is one of design choices resulting in the accumulation buffer having a higher number of bits per color than the image buffer. ΔN as defined by the applicant has no clear advantage over other design choices, and the specific definition still falls under the range of bit size disclosed by McReynolds.

It would have been obvious to someone of the ordinary skill in the ad to take the teachings of Morein, Haeberli, and MacInnis and to take from McReynolds et al. and one of many design choices to modify the bit size of the accumulation buffer to be at least ΔN larger than that of the image buffer, where ΔN is defined as stated in the claim language, in order to maintain color precision accuracy over many blending operations. This is the same motivation as applied to claims 8 and 18 above.

Claims 8, 18-19, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morein in view of Haeberli and MacInnis, and further in view of McReynolds.

In reference to claims 8 and 18, Morein, Haeberli, and MacInnis teach the method of claim 7, but does not explicitly teach the color precision of the accumulation buffer is greater than the color precision of the image buffer. It is well known and obvious, however, to implement a more precise output data calculation in order to avoid losing original data precision and minimize aliasing. An analogous art, McReynolds et al., teaches said limitations.

- McReynolds et al. teaches that 'in order to maintain accuracy over many blending operations, the accumulation buffer has a higher number of bits per color components than a typical color buffer (section 6.4, lines 3-4). Higher number of bits per color components will result in greater color precision for the accumulation buffer.

It would have been obvious to someone of ordinary skill in the art to take the teachings of Morein, Haeberli, and MacInnis and to add from McReynolds, the method of providing higher color precision of the accumulation buffer than the color precision of the image buffer in order to maintain color precision accuracy over many blending operations. This prevents loss of data and alleviates aliasing problems. It is always important to maintain precise accuracy of data after any data processing.

In reference to claim 19, Morein, Haeberli, and MacInnis teach the method

and system of claim claims 7 and 17 above and Morein, Haeberli, and MacInnis

and McReynolds teach the system of claims 8, 18, and 22 above. In addition,

remember that Morein teaches a first and a second accumulator in order to

minimize the delay between accumulation and rendering. Since each pixel

provides a RGB color component and an alpha value, each of the plurality of

accumulators is capable of mixing a corresponding color component. Morein also

explicitly teaches that if the color data includes multiple color portions, such as

red, green, and blue portions, each of these portions will be treated individually

by the output block (Col. 6, lines 37-42), and thus it would have been obvious to

one of ordinary skill in the art at the time of the invention to take the teachings of

Morein and Haeberli and to implement a plurality of mixing units to accumulate

individual color components. Since parallel processing is well known and obvious

in the ad, it would have been obvious to use a plurality of mixing units to

comprise the controller (160) of Morein. Haeberli et al further suggests this, since

an accumulator buffer comprises 16 bit to store each red, green, blue, and alpha

components, it would be wise to apply a different mixer for each component in

order to perform parallel processing and speed up the overall image processing.

In reference to claim 22, Morein, Haeberli, and MacInnis teach the system

of claim 17, and Morein, Haeberli, MacInnis, and McReynolds teach the system

of claim 18 above. While Morein, Haeberli, and MacInnis do not explicitly teach

the color precision of the accumulation buffer is at least ΔN larger than the color

precision of the image buffer, wherein ΔN is the base two logarithm of the

maximum number of images to be blended into the accumulation buffer, McReynolds et al. teaches said limitation in the following in similar fashion as applied to claims 8 and 18 above.

As applied to claims 8 and 18 above, McReynolds et al. teaches that in order to maintain accuracy over many blending operations, the accumulation buffer has a higher number of bits per color components than a typical color buffer (section 6.4, lines 3-4). Higher number of bits per color components than a typical color buffer is interpreting broadly as to include the bit range ΔN larger than the color precision of the image buffer. The definition of ΔN, base two log of maximum number of images to be blended into the accumulation buffer, is one of design choices resulting in the accumulation buffer having a higher number of bits per color than the image buffer. ΔN as defined by the applicant has no clear advantage over other design choices, and the specific definition still falls under the range of bit size disclosed by McReynolds.

It would have been obvious to someone of the ordinary skill in the ad to take the teachings of Morein, Haeberli, and MacInnis and to take from McReynolds et al. and one of many design choices to modify the bit size of the accumulation buffer to be at least ΔN larger than that of the image buffer, where ΔN is defined as stated in the claim language, in order to maintain color precision accuracy over many blending operations. This is the same motivation as applied to claims 8 and 18 above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric Woods whose telephone number is 571-272-7775. The examiner can normally be reached on M-F 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Razavi can be reached on 571-272-7664. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Eric Woods

December 21, 2005

ALMIS R. JANKUS
PRIMARY EXAMINER